

10/25/16 "Genius is 1% inspiration and 99% perspiration" -Thomas Edison

HW: "Adding & Subtracting Rational Expressions" w/s
Test 3 Friday 11/4

AIM: How do we Add/Subtract Rational Expressions?

Warm Up:

$$1) \begin{matrix} (2) & 5 & & 7 \\ (2) & 19 & + & 38 \end{matrix}$$

$$\frac{10}{38} + \frac{7}{38} = \boxed{\frac{17}{38}}$$

$$2) \begin{matrix} (5) & 2 & & 3 & (3) \\ (5) & 15 & - & 25 & (3) \end{matrix}$$

$$\frac{10}{75} - \frac{9}{75}$$

$$= \left(\frac{1}{75} \right)$$

LCD - Bottom
of Fraction
(Smallest piece
that all denom.
go into (+, -))

GCF - Largest
term that can
be factored
out (Reduce)

The Basic RULE for Adding and Subtracting Fractions:

Get a Common Denominator!

Steps for Adding/Subtracting Rational Expressions:

- 1) Find the common denominator
(Remember to factor first)
- 2) Re-write the fractions so that they have the common denominator.
- 3) Perform the indicated operation.
- 4) Simplify (Reduce) if possible.
⊗ Don't forget to look for restrictions right before simplifying.

Examples:

1) What is the least common multiple (LCM) of

Factor! $2x^2 - 8x + 8$ and $15x^2 - 60$?

$$\begin{array}{l|l} 2(x^2 - 4x + 4) & 15(x^2 - 4) \\ 2(x-2)(x-2) & 15(\cancel{x-2})(x+2) \end{array}$$

⊗ To find an LCD make sure that each factor of each denominator is in it.

LCM =

$$2(\overset{\vee}{x-2})(x-2)(15)(x+2)$$

$$\boxed{30(x-2)(x-2)(x+2)}$$

2) What is the sum in simplest form?

$$\frac{1}{3x^2 + 21x + 30} + \frac{4x}{3x + 15}$$

$\xrightarrow{\text{LCD: } 3(x+5)(x+2)}$
 $\frac{1}{3(x+5)(x+2)} + \frac{4x}{3(x+5)(x+2)}$

$$\frac{1}{3(x+5)(x+2)} + \frac{4x^2 + 8x}{3(x+5)(x+2)} = \frac{4x^2 + 8x + 1}{3(x+5)(x+2)}$$

$x \neq -5, -2$

3) Find the difference in simplest form

$$(4) \frac{2x}{x^2 - 2x - 3} - \frac{3}{4x + 4} \quad \left| \begin{array}{l} \text{LCD:} \\ (x-3)(x+1)(4) \end{array} \right.$$

$$(4) \frac{x^2 - 2x - 3}{(x-3)(x+1)} - \frac{4x + 4}{4(x+1)(x-3)}$$

$$\frac{8x}{4(x-3)(x+1)} + \frac{-3x + 9}{4(x-3)(x+1)}$$

Switch to (+) and change all the signs of the following numerator.

$$\frac{8x - 3x + 9}{4(x-3)(x+1)} = \boxed{\frac{5x + 9}{4(x-3)(x+1)}}$$

$x \neq 3, -1$
rest

Practice:

a) $\frac{3}{4} + \frac{2}{7}$

LCD: $x(x+3)$

b) $\frac{6}{x} - \frac{7}{x+3}$

$$\frac{6x+18}{x(x+3)} + \frac{-7x}{x(x+3)}$$

$$\frac{6x+18-7x}{x(x+3)} = \frac{-x+18}{x(x+3)}$$

$x \neq -3, 0$

c) $\frac{6}{x} + \frac{7}{xy}$

1) $\frac{2x+3}{6x} - \frac{x-2}{4x}$

$$\frac{4x+6}{12x} + \frac{-3x+6}{12x}$$

$$\frac{4x+6-3x+6}{12x} = \frac{x+12}{12x}$$

LCD: $2 \cdot 3 \cdot 2 \cdot x$
 $12x$

6	6, 12, 18, 24
4	4, 8, 12, 16

2) $\frac{3}{x+2} + \frac{x-2}{x}$

LCD: $x(x+2)$
rest. $x \neq -2$
 $x \neq 0$

$$\frac{3x}{x(x+2)} + \frac{x^2-4}{x(x+2)} = \frac{x^2+3x-4}{x(x+2)} = \frac{(x+4)(x-1)}{x(x+2)}$$

$$3) \frac{6}{y-5} - \frac{\cancel{y+5}}{\cancel{y+5}(y-5)} = \frac{6}{y-5} + \frac{-1}{y-5}$$

be careful to include the restriction $y \neq 5, -5$

$\frac{5}{y-5}$

⊗ If we can reduce a fraction before we look for an LCD, we should.

$$4) \frac{2}{a^2-4} - \frac{1}{a^2+2a}$$

$$5) \frac{1}{2-x} + \frac{2}{x-2}$$

$$6) \frac{x}{x^2-4x+3} - \frac{x}{x^2+2x-3}$$

$$4) (a) \frac{2}{a^2-4} - \frac{1}{a^2+2a}$$

$$(a) (a+2)(a-2) \quad a(a+2)(a-2)$$

LCD:

$$(a+2)(a-2)a$$

$$\frac{2a}{a(a+2)(a-2)} + \frac{-a+2}{a(a+2)(a-2)} = \frac{\cancel{a+2}}{a\cancel{(a+2)}(a-2)} = \frac{1}{a(a-2)}$$

HW: 2, 5, 6, 7, 10

$a \neq 2, -2, 0$

OR

$$\frac{1}{a^2-2a}$$

$$5) \frac{1}{2-x} + \frac{2}{x-2}$$

$$-1(x-2)$$

$$\frac{-1}{x-2} + \frac{2}{x-2} = \frac{1}{x-2}$$

$x \neq 2$

* If we have both denominators with the same terms separated by subtraction in reverse order, switch the order of one of them and then negate its numerator.

Commutative Property

$$\frac{1}{2-x} + \frac{2}{x-2}$$

Divide by -1 to Reduce

$$\frac{1}{1(x-2)} = \frac{-1}{x-2}$$

Alt:

$$\frac{(x-2)}{(x-2)} \frac{1}{2-x} + \frac{2}{x-2} \frac{(2-x)}{(2-x)}$$

LCD:

$$(2-x)(x-2)$$

$$\frac{x-2}{(2-x)(x-2)} + \frac{4-2x}{(2-x)(x-2)} = \frac{-x+2}{(2-x)(x-2)} = \frac{-1(x-2)}{(2-x)(x-2)}$$

$$\frac{-1}{2-x}$$

$$\frac{-1}{2} \quad \frac{1}{-2} \quad - \quad \frac{1}{2}$$

$$6) \frac{\cancel{(x+3)} \cdot x}{\cancel{(x+3)} x^2 - 4x + 3} - \frac{x \cdot \cancel{(x-3)}}{x^2 + 2x - 3 \cdot \cancel{(x-3)}} \quad \text{LCD: } (x-1)(x-3)(x+3)$$

$x \neq 1, 3, -3$
restrictions

$(x-1)(x-3) \quad (x-1)(x+3)$

$$\frac{x^2 + 3x}{(x-1)(x-3)(x+3)} + \frac{-x^2 + 3x}{(x-1)(x+3)(x-3)}$$

$$\frac{x^2 - x^2 + 3x + 3x}{(x-1)(x+3)(x-3)} = \frac{6x}{(x-1)(x+3)(x-3)}$$

$$\frac{1}{x-2} = \frac{-1}{2-x} \frac{(-1)}{(-1)}$$

$$\rightarrow \frac{1}{\frac{-2+x}{x-2}}$$

$$7) \frac{\frac{(y+3)}{(y+3)} y}{y-3} - \frac{18}{y^2-9}$$

$$(y-3)(y+3)$$

LCD:
 $(y-3)(y+3)$
 $y \neq -3, 3$

$$\frac{y^2 + 3y - 18}{(y-3)(y+3)} = \frac{(y+6)\cancel{(y-3)}}{\cancel{(y-3)}(y+3)} = \boxed{\frac{y+6}{y+3}}$$

HW # 8, 9, 11, 12, 13

$$7) \frac{y}{y-3} - \frac{18}{y^2-9}$$

$$8) \frac{2}{a+1} + \frac{3}{a^2-1}$$

$$9) \frac{2}{5a} + \frac{1}{4a}$$

$$10) \frac{1}{2a+2} + \frac{1}{a^2-1}$$

$$11) \frac{3}{x-3} + \frac{x}{3-x}$$

$$12) \frac{b}{b-1} - \frac{1}{2-2b}$$

$$13) \frac{1}{a+2} + \frac{a}{a^2+a} \div \frac{a}{a+1}$$